

HAZARD ZONES DEMARKING INUNDATION LIMITS FOR DEBRIS FLOWS AND DEBRIS AVALANCHES AT VOLCAN COLIMA, MEXICO

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Volcan Colima, the most active volcano in Mexico, is approaching the climactic phase of its eruptive cycle. The historic repose period between its catastrophic phases is about 100 years indicating that a major explosion appears eminent. Eruptions in 1998-99 produced numerous pyroclastic flows to the south and southwest and fine volcanic ash deposited northeast of the volcano. Huge volcanic debris flows with a recurrence interval of between 2,000 and 4,000 years resulted from repeated edifice collapse. The probability of structural failure should be higher during a major explosive episode, suggesting that this type of event cannot be an excluded scenario. Volcanic debris avalanches, modeled using FLOW3D and a Heim coefficient of 0.09, correspond fairly well to the spatial distribution of the past deposits. All debris flows, regardless of source type, eventually move down one of the two major river systems, Rio Tuxpan to the east and Rio Armeria to the west. Present river valleys incise volcanic debris avalanche deposits as young as 2,300 years. Terraces within these river channels are compatible with their formation by debris flows of magnitudes in the range of those modeled. Assuming likely source areas in ash fall, pyroclastic flow, and volcanic avalanche deposits, inundation zones for lahar volumes of 3 magnitudes (10^6 to 10^8 m³) were simulated with ArcInfo using the LAHARZ model developed by Iverson and others (1998). Their GIS code calculates flow cross sectional areas to plot the width of the peak flow in the river valleys and uses planimetric area to map the flow extent. Mudflows of all studied magnitudes remain within the principal valleys of the two rivers. The largest studied debris flows have a runout of 37 to 51 km but the smallest flows reach only 3 to 4 km from their source. Unfortunately, a large lumber-producing town, Atenquique, is at high risk for moderate to large lahars because it is near the volcano and at the bottom of a deep canyon. At this location the hydraulic radius of the largest model lahars (10^8 m³) would be about 75 m and that of the intermediate flows (10^7 m³) would be about 40 m. Atenquique would be inundated by such mudflows.